

Listing of the Claims:

1 (Currently Amended). A System for determining the orientation of the eye consisting of the following sub-systems:

an x, y high-speed eye tracking system, for measuring the very fast translation or saccadic motion of the eye, relative to an ophthalmic surgical, diagnostic or treatment device or instrument;

a second position measurement system for measuring slower eye movements, such as multiple dimensions of eye position and / or position of eye parts, relative to an ophthalmic surgical, diagnostic or treatment device or instrument; and

a system for combining the measurements of the two previous systems for obtaining a multiple dimensional model of the eye position that is more accurate than the model obtainable from either system individually; wherein the x, y eye tracking system is either a multiple imaging device solution in which one imaging device is coaxial to the eye and either one or two off-axis imaging devices using selective line readout, or a single high speed imaging device using ~~of~~ selective line readout, said system comprising

an imaging device sensor configured to individually address and read a set of selected lines;

a processing device for processing data which has been transferred from said imaging device sensor to said processing device; and

a laser treatment device the position of which is controlled by a laser position control, wherein, while the rest of the image is being transferred, the set of selected lines which has already been transferred is processed to obtain a processing result which is used to position the laser position control of said laser treatment device, and wherein after the image has been fully transferred to a processing device, the full image is processed in order to establish a future set of selected lines based on a tracked landmark.

2 (Cancelled)

3 (Previously presented). The system according to claim 1, wherein the second eye position measurement system is a single coaxial imaging device or multiple imaging devices for measuring the eye, or a non-image based depth measurement system.

4 (Previously presented). The system according to claim 1, where the system for combining the measurements obtains the multiple dimensional model of the eye position in order to calibrate one or both of the eye tracking devices, such as set the region of interest, spot location, or scanning limits for the other eye location device; or to provide 3 or more dimensions of eye position.

5 (Original). The system according to claim 1, which includes a structured illumination and according filtering means to improve visibility of a unique combination of trackable features.

6 (Currently Amended). A method for determining the orientation of the eye consisting of the following steps:

tracking eye movement at a tracking rate that is sufficiently fast to follow the saccadic motion of the eye;

measuring other slower changing positions for the eye or parts of the eye at a slow rate, relative to an ophthalmic surgical, diagnostic or treatment device or instrument;
~~and~~

combining the measurements of the two previous systems to obtain a multiple dimensional model of the eye position that is more accurate than the model obtainable from either system individually; wherein the step of eye tracking is performed by either multiple imaging devices and the use of selective line readout or by a single imaging device using selective line readout;

individually addressing and reading out a set of selected lines of an imaging device sensor and transferring them to a processing device for processing;

while the rest of the image is being transferred, processing the set of selected lines which has already being transferred to obtain a processing result which is used to position the laser position control of said laser treatment device; and

after the full image has been transferred to a processing device, processing the full image in order to establish the future set of selected lines based on a tracked landmark.

7 (Cancelled)

8 (Previously presented). The method according to claim 6, where the position measurement of other components of eye movement comprises either detecting foreign objects or compensating for pupil offset or measuring torsion or measuring eye rotation or measuring depth or a combination thereof.

9 (Previously presented). The method according to claim 6, which includes structured illuminating and filtering method to improve visibility of a unique combination of trackable features.

10 (Previously amended). The system of claim 1, said system comprising.

a means for making a reference measurement of three or more points on the eye, in three dimensions;

a means for measuring these same reference points at a subsequent time in three dimensions; and

a means for determining the position of the eye from the change in position at these multiple points.

11 (Previously amended). The-method of claim 6, said method comprising:

making a reference measurement of three or more points on the eye, in three dimensions;

measuring the same points at a subsequent time in three dimensions;

determining the orientation from the eye from the change in position at these multiple points.

12 (Previously amended). The system of claim 1, said system comprising:

a means for tracking the translational eye position;

a means for tracking the translational head position; and

a means for determining the rotation of the eye from the variation of difference between head position and eye position.

13 (Previously amended). The method of claim 6, said method comprising:

measuring the translational eye position;

measuring the translational head position; and

determining the rotation of the eye from the variation of difference between head position and eye position.

14 (Canceled).

15 (Canceled).

16 (Canceled).

17 (Canceled).

18 (Previously presented). A use of the system according to claim 1, for the purpose of laser refractive surgery in order to intra-operatively update the pre-programmed shot pattern on the basis of the determined orientation of the eye to correct for eye position and its effect on correction efficacy.

19 (Previously presented). A use of the method according to claim 6, for the purpose of laser refractive surgery in order to intra-operatively update the pre-programmed shot pattern on the basis of the determined orientation of the eye to correct for eye position and its effect on correction efficacy.

20 (Previously Presented). The system of claim 1, wherein the lines used for selective line readout are selected by picking up the lines with the highest probability to be located on the tracked landmark.

21 (Previously Presented). The method of claim 6, wherein the lines used for selective line readout are selected by picking up the lines with the highest probability to be located on the tracked landmark